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```
clear
close all
% clc

time_horizon = 50;
time_const = 1/2*time_horizon;
init_heading = pi/10;
sampling_time = 0.1;
box_halflength = 4;
omega = pi/time_horizon/sampling_time;
turning_rate = omega*ones(time_horizon,1);
dist_cov = 0.001;
probability_threshold_of_interest = 0.8;
no_of_direction_vectors_ccc = 16;
v_nominal = 10;
umax = v_nominal/3*2;
```

LTV system definition

```
[sys, heading_vec] = getDubinsCarLtv('add-dist', ...
turning_rate, ...
init_heading, ...
sampling_time, ...
Polyhedron('lb',0,'ub',umax), ...
eye(2), ...
RandomVector('Gaussian',zeros(2,1), dist_cov * eye(2)));

target_tube_cell = cell(time_horizon + 1,1);
```

Target tube definition

```
figure(100);clf;hold on
angle_at_the_center = (heading_vec) - pi/2;
center_box = zeros(2, time_horizon + 1);
for itt = 0:time_horizon
    center_box(:, itt+1) = v_nominal * [cos(angle_at_the_center(itt
+1))-cos(angle_at_the_center(1));
                                        sin(angle_at_the_center(itt
+1))-sin(angle_at_the_center(1))];
```

```
    target_tube_cell{itt+1} = Polyhedron('lb',center_box(:, itt+1) -
 box_halflength * exp(- itt/time_const), 'ub', center_box(:, itt+1) +
 box_halflength*exp(- itt/time_const));
    plot(target_tube_cell{itt+1},'alpha',0.5,'color','y');
end
axis equal
axis([-8    10   -5    21]);
box on;
grid on;

target_tube = Tube(target_tube_cell{:});
```
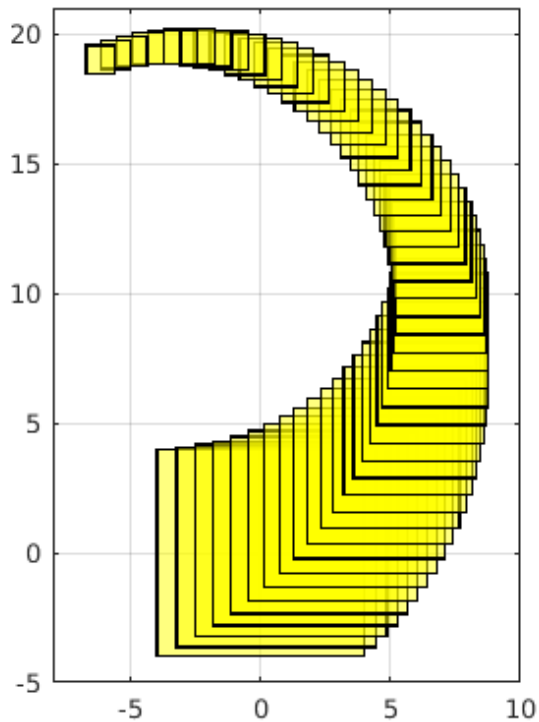

Set of direction vectors

```
theta_vector_ccc = linspace(0, 2*pi, no_of_direction_vectors_ccc+1);
theta_vector_ccc = theta_vector_ccc(1:end-1);
set_of_direction_vectors_ccc = [cos(theta_vector_ccc);
                                sin(theta_vector_ccc)];
```

Set computation

```
timer_polytope_ccc = tic;
opts = SReachSetOptions('term', 'chance-open', 'pwa_accuracy',
 1e-3, ...
        'set_of_dir_vecs', set_of_direction_vectors_ccc, ...
```

```
        'init_safe_set_affine',Polyhedron(),'verbose',0);
[ccc_polytope, extra_info] = SReachSet('term','chance-open', sys, 0.8,
 target_tube, opts);
elapsed_time_polytope_ccc = toc(timer_polytope_ccc);
fprintf('Time taken for computing the polytope (CCC): %1.3f s\n',
 elapsed_time_polytope_ccc);

Time taken for computing the polytope (CCC): 76.979 s
```

Plot the set

```
figure(101);
clf;
hold on;
plot(target_tube(1));
%
 plot(underapproximate_stochastic_reach_avoid_polytope_ccc,'color','m');
plot(ccc_polytope,'color','b');
axis equal
axis (1.2*[-box_halflength box_halflength -box_halflength
 box_halflength]);
box on;
legend('Target set at t=0','Stochastic reach
 set','Location','SouthEast');
set(gca,'FontSize',20);
```

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